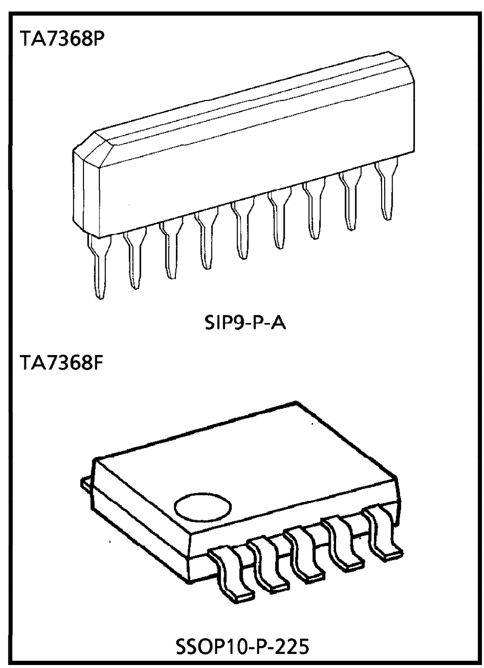
TOSHIBA BIPOLAR LINAR INTEGRATED CIRCUIT

TA7368P, TA7368F

SILICON MONOLITHIC

AUDIO POWER AMPLIFIER

The TA7368P and TA7368F are suitable for the audio power amplifier of portable cassette tape recorder and radio.

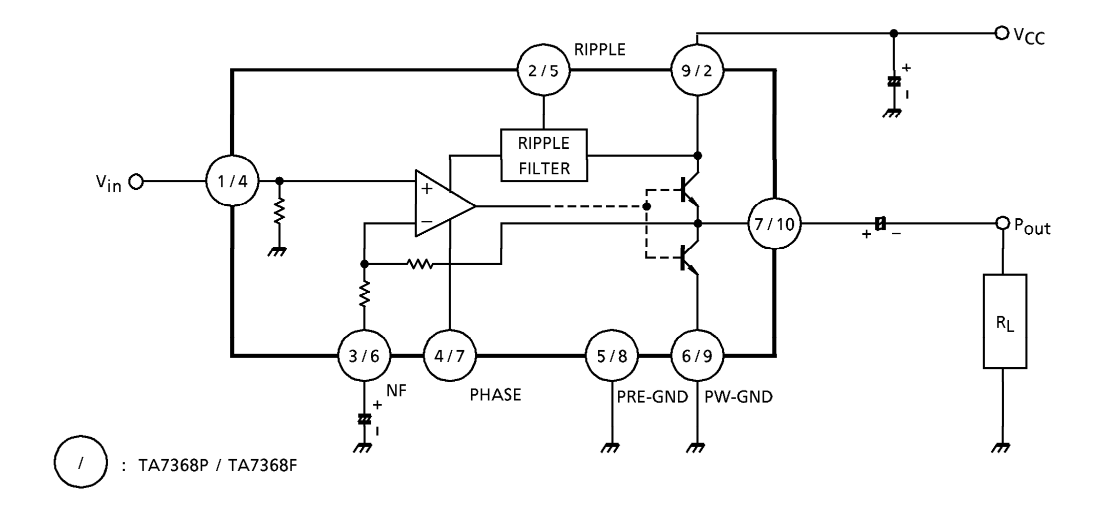


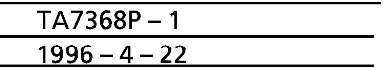
Weight SIP9-P-A : 0.92g (Typ.)
SSOP10-P-225 : 0.09g (Typ.)

FEATURES

- Very few external parts (Only three capacitors)
- Low quiescent current : $I_{CCQ} = 6.6mA$ (Typ.) ($V_{CC} = 6V$)
- Output Power
  TA7368P
  : $P_{out} = 720mW$ (Typ.) ($V_{CC} = 6V$, $R_L = 4\Omega$, THD = 10%)
  TA7368P / F
  : $P_{out} = 450mW$ (Typ.) ($V_{CC} = 6V$, $R_L = 8\Omega$, THD = 10%)
- Voltage gain : $G_V = 40dB$ (Typ.)
- Operating supply voltage range : $V_{CC} = 2\sim10V$ (Ta = 25°C)

BLOCK DIAGRAM





PRECAUTION FOR USE AND APPLICATION

1. Input stage

   The input stage of power amplifier (Equivalent circuit) is comprised of a PNP differential pair (Q_2 and Q_3) preceded by a PNP emitter follower (Q_1) which allows DC referencing of the source signal to ground. This eliminated the need for an input coupling capacitor. However, in case the brush noise of volume becomes a problem, provide serially a coupling capacitor to the input side.

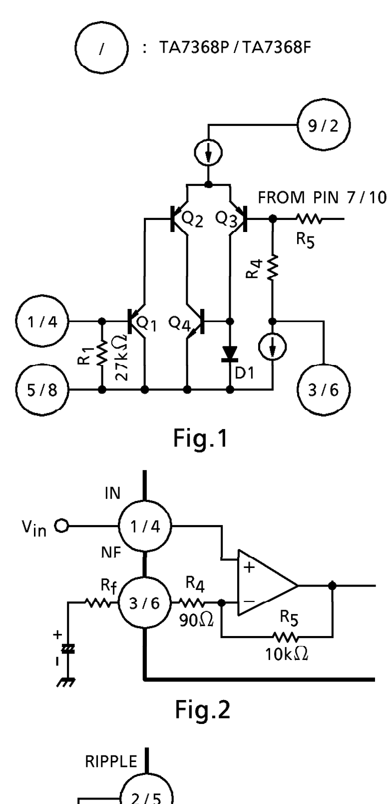


Fig.1

Fig.2

2. Adjustment of voltage gain

   The voltage gain is fixed at $G_V \doteqdot 40dB$ by the resistors (R_4 and R_5) in IC, however, its reduction is possible through adding R_f as shown in Figure 2. In this case, the voltage gain is obtained by the following equation.

$$G_V = 20\ell og \frac{R_5 + R_4 + R_f}{R_4 + R_f}$$

   It is recommended to use this IC with the voltage gain of $G_V = 28dB$ or over.

3. Ripple rejection ratio

   Adding C_{RIP}, to ripple terminal 2 as shown in Figure 3, the ripple rejection ratio is improved from −25dB Typ. to −45dB Typ.

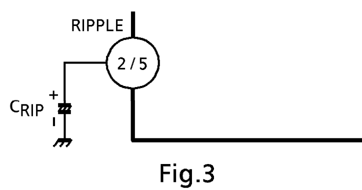


Fig.3

4. Power dissipation

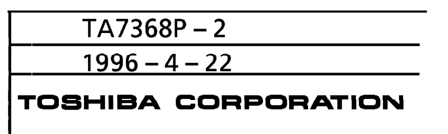
   Care should be taken to use this IC below maximum power dissipation. Because it may over maximum rating depending on operating condition.

   - TA7368P $P_D = 900mW$ (Ta = 25°C)
   - TA7368F $P_D = 400mW$ (Ta = 25°C)

5. Phase-compensation

   Small temperature coefficient and excellent frequency characteristic is needed by capacitors below.

   - Oscillation preventing capacitors for power amplifier output
   - Bypass capacitor for ripple filter
   - Capacitor between V_{CC} and GND



MAXIMUM RATINGS ($Ta = 25°C$)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{CC}	14	V
Power Dissipation	TA7368P	P_D (Note)	900	mW
	TA7368F		400	
Operating Temperature		T_{opr}	−25~75	°C
Storage Temperature		T_{stg}	−55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 7.2mW / °C for TA7368P and of 3.2mW / °C for TA7368F.

ELECTRICAL CHARACTERISTICS FOR TA7368P

(Unless otherwise specified, $V_{CC} = 6V$, $f = 1kHz$, $R_g = 600\Omega$, $R_L = 4\Omega$, $Ta = 25°C$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCQ}	—	$V_{CC} = 3V$, $V_{in} = 0$	—	5.5	—	mA
			$V_{CC} = 6V$, $V_{in} = 0$	—	6.6	15	
			$V_{CC} = 9V$, $V_{in} = 0$	—	7.5	18	
Output Power	P_{out}	—	$V_{CC} = 3V$, $R_L = 4\Omega$, THD = 10%	—	120	—	mW
			$V_{CC} = 6V$, $R_L = 4\Omega$, THD = 10%	500	720	—	
			$V_{CC} = 6V$, $R_L = 8\Omega$, THD = 10%	300	450	—	
			$V_{CC} = 9V$, $R_L = 8\Omega$, THD = 10%	800	1100	—	
			$V_{CC} = 9V$, $R_L = 16\Omega$, THD = 10%	450	610	—	
Total Harmonic Distortion	THD	—	$P_{out} = 100mW$	—	0.3	1.0	%
Voltage Gain	G_V	—	$V_{in} = 0.5mV_{rms}$	37	40	43	dB
Output Noise Voltage	V_{no}	—	$R_g = 10k\Omega$, BPF = 20Hz~20kHz	—	0.2	0.5	mV_{rms}
Ripple Rejection Ratio	RR	—	$f_r = 100Hz$, $V_r = 0.3V_{rms}$ Without C_{RIP}	—	25	—	dB
Input Resistance	R_{IN}	—	—	—	27	—	kΩ

TERMINAL VOLTAGE FOR TA7368P

Typical terminal voltage at no signal with test circuit. ($V_{CC} = 6V$, $Ta = 25°C$) [Unit : V]

Terminal No.	1	2	3	4	5	6	7	8	9
DC Voltage (V)	0	2.40	0.62	0.64	0	0	2.61	NC	6.0

ELECTRICAL CHARACTERISTICS FOR TA7368F
(Unless otherwise specified, $V_{CC}=6V$, $f=1kHz$, $R_g=600\Omega$, $R_L=8\Omega$, $Ta=25°C$)

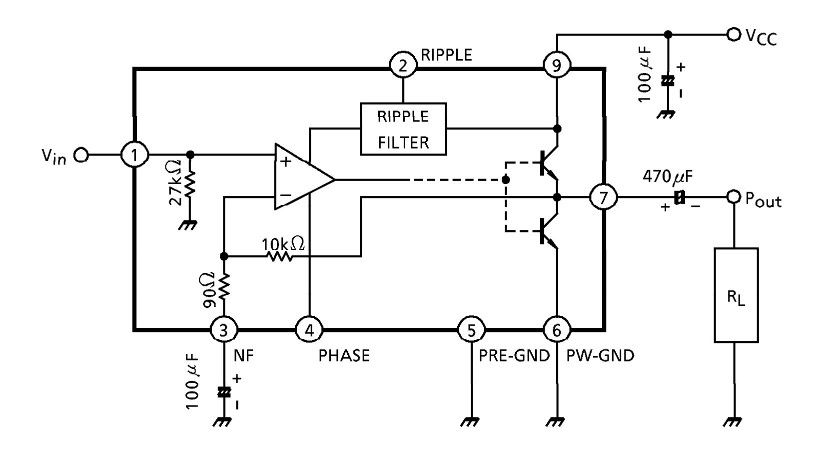
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCQ}	—	$V_{CC}=3V$, $V_{in}=0$	—	5.5	—	mA
			$V_{CC}=6V$, $V_{in}=0$	—	6.6	15	
			$V_{CC}=9V$, $V_{in}=0$	—	7.5	18	
Output Power	P_{out}	—	$V_{CC}=3V$, $R_L=4\Omega$, THD = 10%	—	120	—	mW
			$V_{CC}=6V$, $R_L=8\Omega$, THD = 10%	300	450	—	
			$V_{CC}=9V$, $R_L=16\Omega$, THD = 10%	450	610	—	
Total Harmonic Distortion	THD	—	$P_{out}=100mW$	—	0.3	1.0	%
Voltage Gain	G_V	—	$V_{in}=0.5mV_{rms}$	37	40	43	dB
Output Noise Voltage	V_{no}	—	$R_g=10k\Omega$, BPF = 20Hz~20kHz	—	0.2	0.5	mV_{rms}
Ripple Rejection Ratio	RR	—	$f_r=100Hz$, $V_r=0.3V_{rms}$, Without C_{RIP}	—	25	—	dB
Input Resistance	R_{IN}	—	—	—	27	—	kΩ

TERMINAL VOLTAGE FOR TA7368F
Typical terminal voltage at no signal with test circuit. ($V_{CC}=6V$, $Ta=25°C$) [Unit : V]

Terminal No.	1	2	3	4	5	6	7	8	9	10
DC Voltage (V)	NC	6.0	NC	0	2.40	0.62	0.64	0	0	2.61

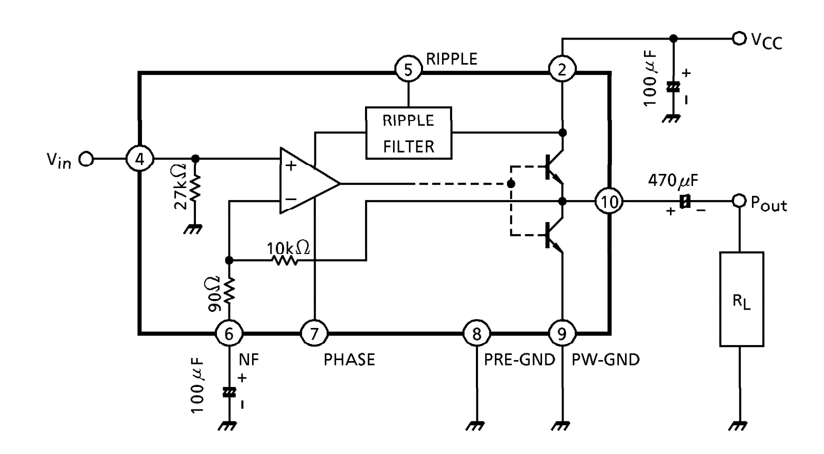
TEST CIRCUIT

TA7368P

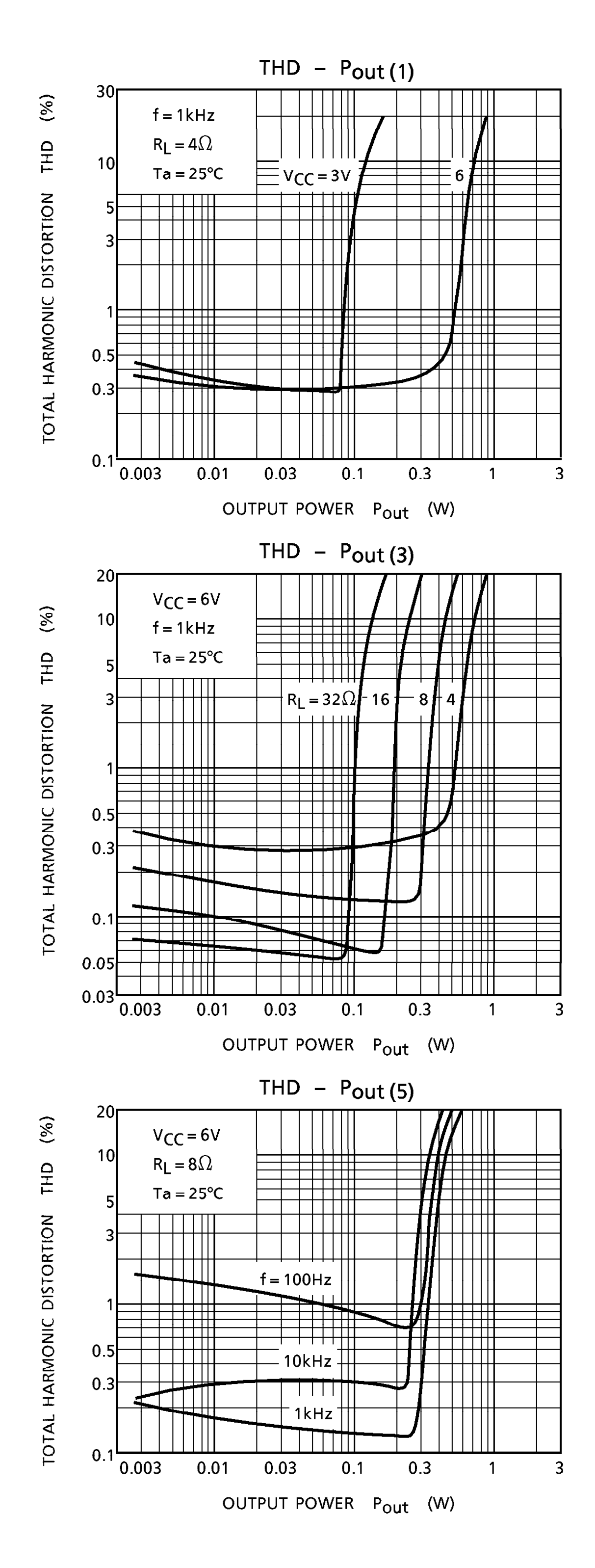


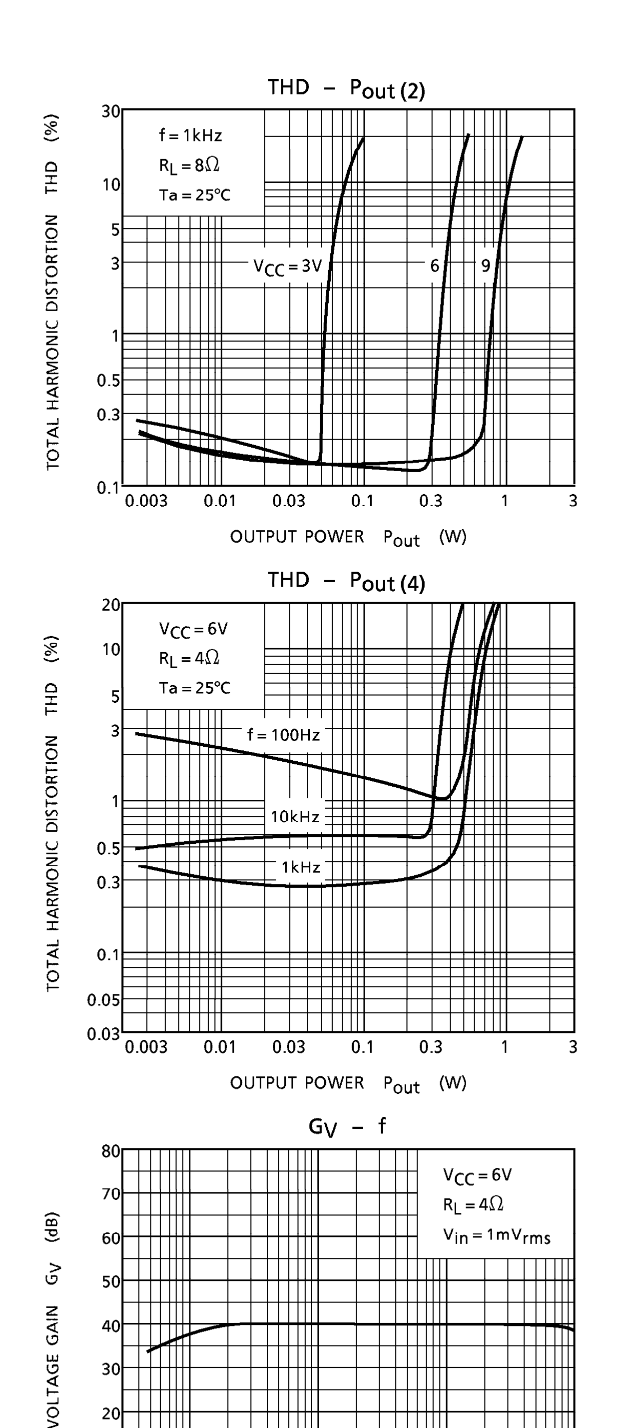
※ Pin⑧ : Non-connection

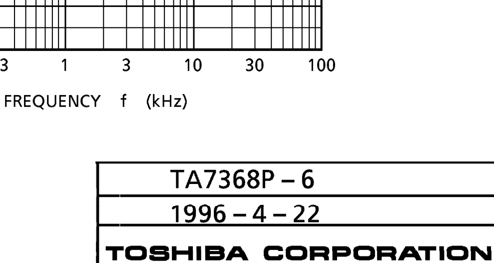
TA7368F

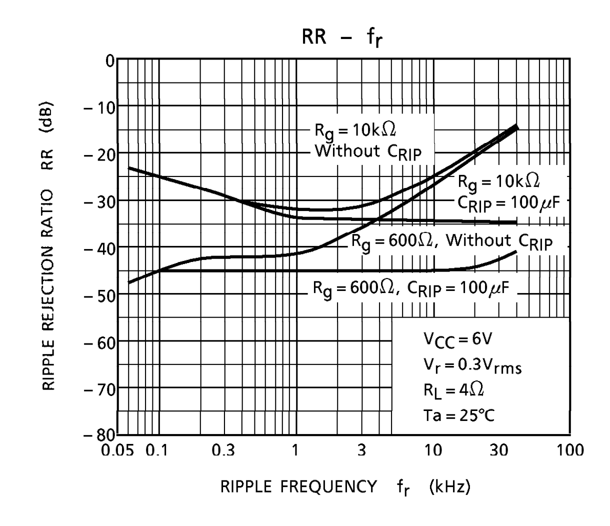


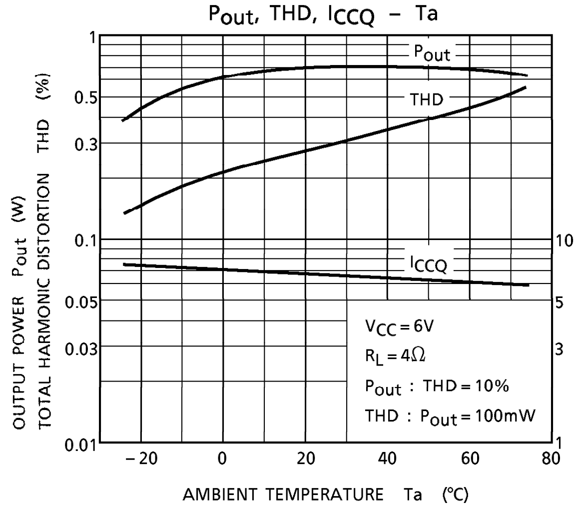
※ Pin①, ③ : Non-connection

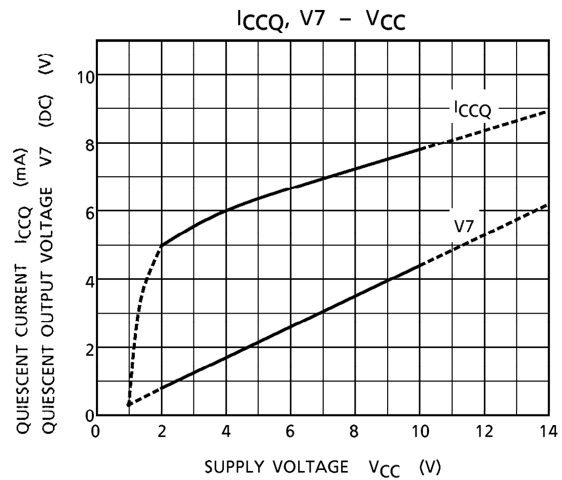

THD – Pout (1)
f = 1kHz
RL = 4Ω
Ta = 25°C
VCC = 3V
6
THD – Pout (3)
VCC = 6V
f = 1kHz
Ta = 25°C
RL = 32Ω
16
8
4
THD – Pout (5)
VCC = 6V
RL = 8Ω
Ta = 25°C
f = 100Hz
10kHz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)

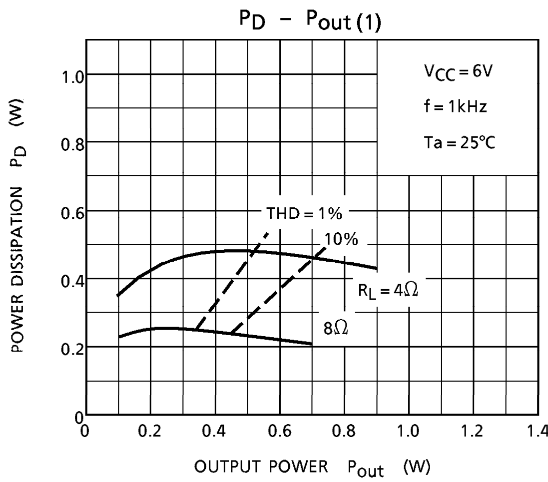

THD – Pout (2)
f = 1kHz
RL = 8Ω
Ta = 25°C
VCC = 3V
6
9
THD – Pout (4)
VCC = 6V
RL = 4Ω
Ta = 25°C
f = 100Hz
10kHz
1kHz
GV – f
VCC = 6V
RL = 4Ω
Vin = 1mVrms
VOLTAGE GAIN GV (dB)
FREQUENCY f (kHz)
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)

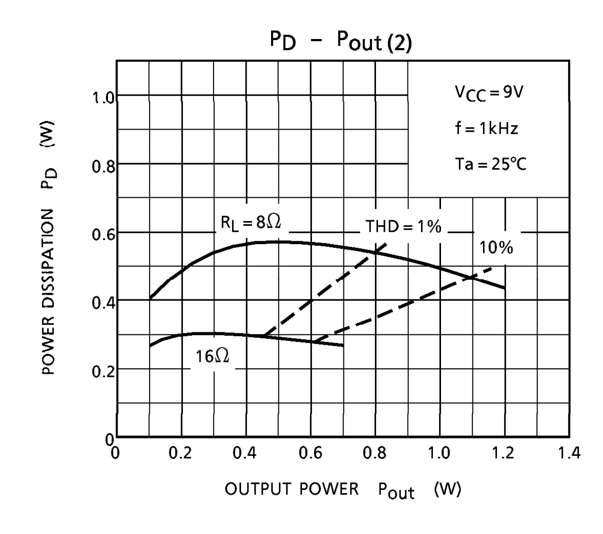


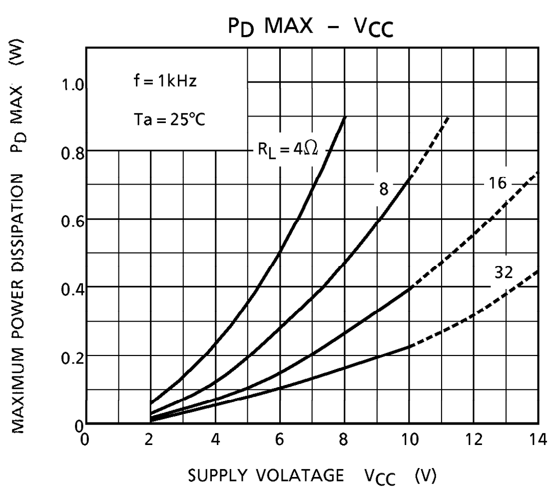

RR – fr
RIPPLE REJECTION RATIO RR (dB)
RIPPLE FREQUENCY fr (kHz)
Rg = 10kΩ Without CRIP
Rg = 10kΩ CRIP = 100μF
Rg = 600Ω, Without CRIP
Rg = 600Ω, CRIP = 100μF
VCC = 6V
Vr = 0.3Vrms
RL = 4Ω
Ta = 25°C

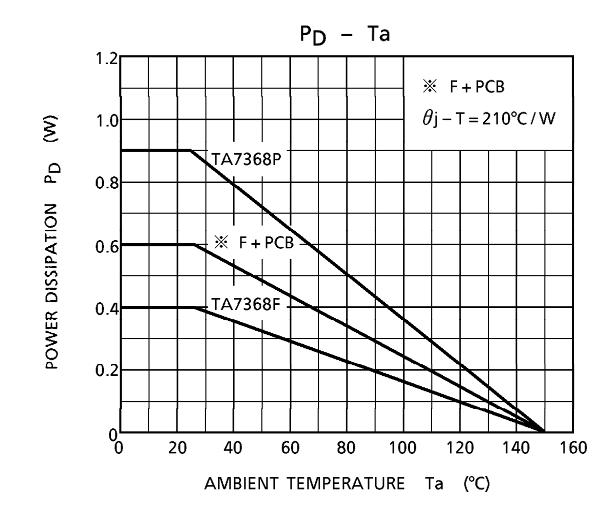

Pout, THD, ICCQ – Ta
OUTPUT POWER Pout (W)
TOTAL HARMONIC DISTORTION THD (%)
QUIESCENT CURRENT ICCQ (mA)
AMBIENT TEMPERATURE Ta (°C)
Pout
THD
ICCQ
VCC = 6V
RL = 4Ω
Pout : THD = 10%
THD : Pout = 100mW


ICCQ, V7 – VCC
QUIESCENT CURRENT ICCQ (mA)
QUIESCENT OUTPUT VOLTAGE V7 (DC) (V)
SUPPLY VOLTAGE VCC (V)
ICCQ
V7


PD – Pout (1)
POWER DISSIPATION PD (W)
OUTPUT POWER Pout (W)
VCC = 6V
f = 1kHz
Ta = 25°C
THD = 1%
10%
RL = 4Ω
8Ω


PD – Pout (2)
POWER DISSIPATION PD (W)
OUTPUT POWER Pout (W)
VCC = 9V
f = 1kHz
Ta = 25°C
RL = 8Ω
THD = 1%
10%
16Ω

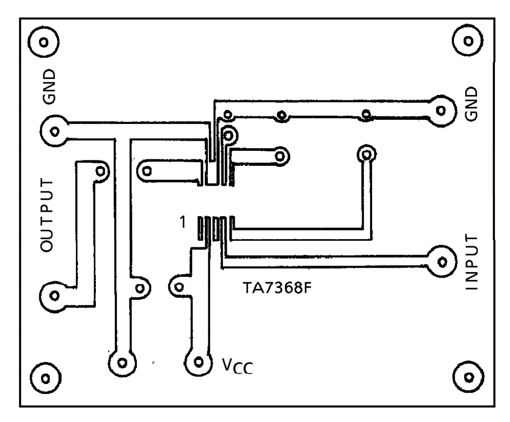

PD MAX – VCC
MAXIMUM POWER DISSIPATION PD MAX (W)
SUPPLY VOLATAGE VCC (V)
f = 1kHz
Ta = 25°C
RL = 4Ω
8
16
32



※ F + PCB

By being mounted on certain PCB's, flat packages increase the heat dissipating efficiency.
Data shown on the left is resulted from the measurement on the PCB recommended by Toshiba.
(θj – T : Thermal resistance)

Printed circuit board



60 × 47.5 (mm)

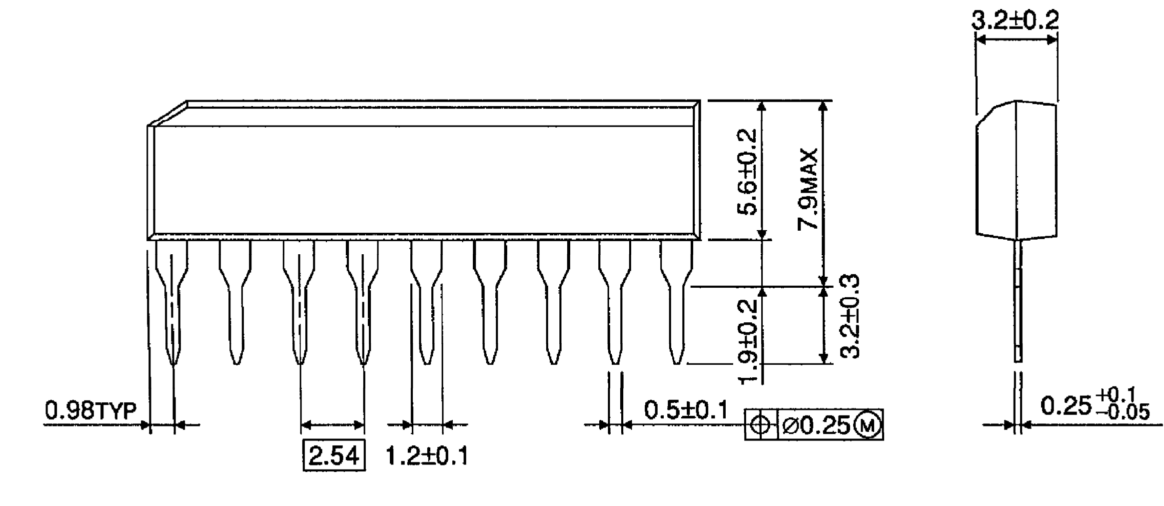
Material : Phenol resin

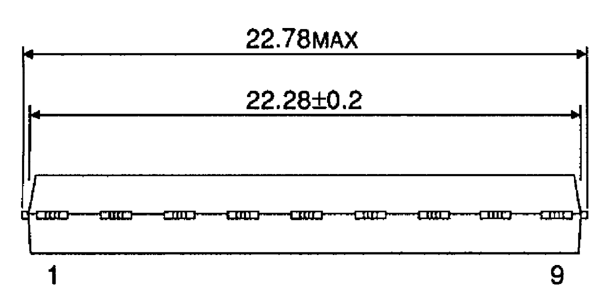
Thickness of copper leaf : 35μm

Plate thickness : 1.6mm

OUTLINE DRAWING
SIP9-P-A

Unit : mm

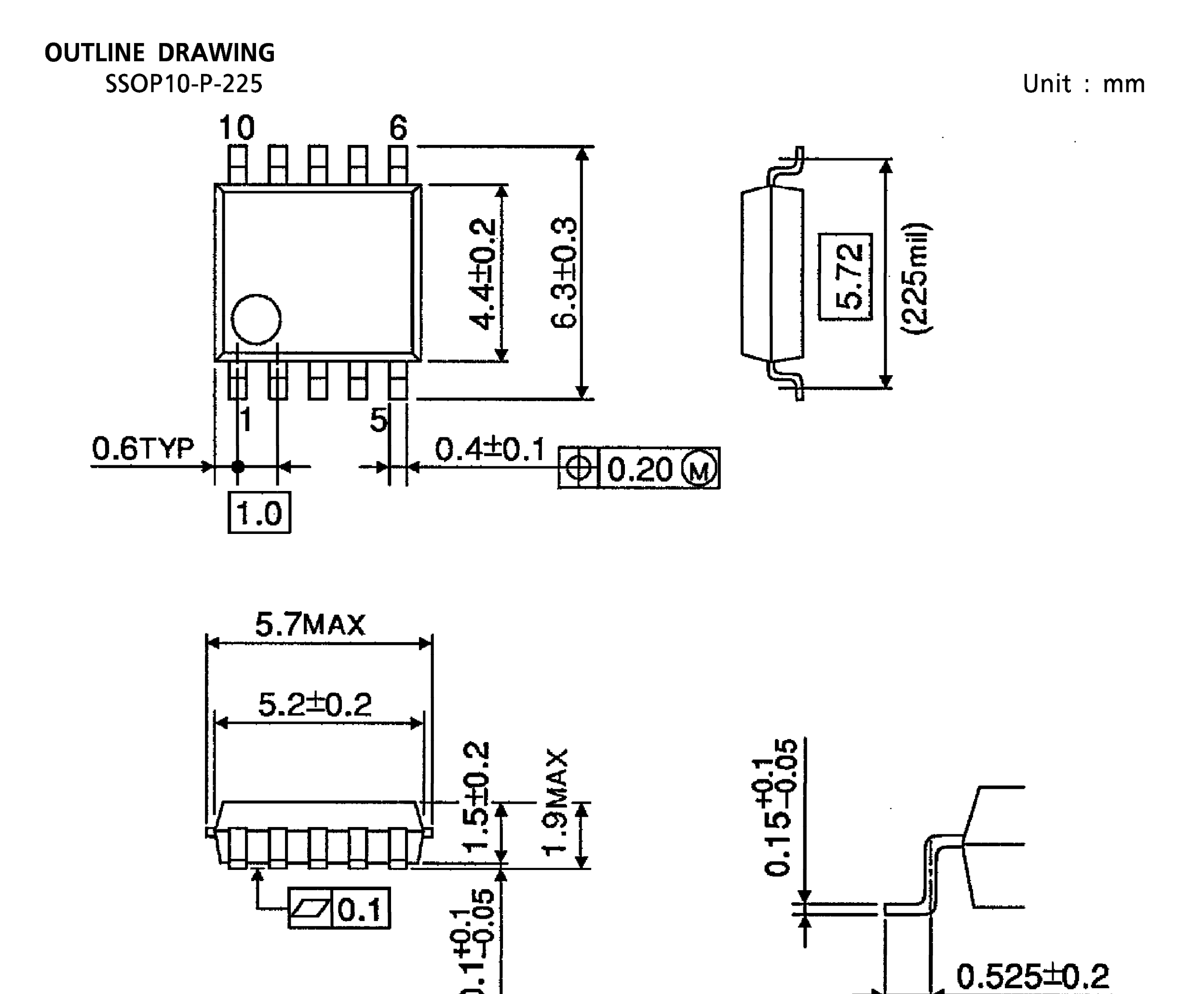




Weight : 0.92g (Typ.)

OUTLINE DRAWING
SSOP10-P-225

Unit : mm



Weight : 0.10g (Typ.)